

# State-owned primary copper producing industry in India: perspective and problems

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## Perspective

Metals and minerals are critical for industrialization, growth and prosperity; the need for them in developing countries like India cannot be overestimated. However, with a few exceptions (such as iron ores and metallurgical-grade bauxite) availability of metals and minerals is limited. While adequate coal is available for power generation, reserves of phosphates, non-ferrous metals like copper, lead and zinc, nickel, cobalt and tin are particularly poor.

## Creation of state-owned enterprises - objectives

Because of limited natural resources and a poor infrastructure for industrial development, India felt that control over the means of production would be required to foster balanced economic growth, self-reliance and optimum utilization of its minerals. The Industrial Policy Resolutions of 1948 and 1956 created state-owned enterprises to meet the national goals and objectives enumerated in Five Year Plans.

The major objectives of public enterprises are as follows:

- to aid in rapid national industrialization and economic growth, and to create the infrastructure required for development

- to earn a return on investment sufficient to generate further development resources
- to promote redistribution of income and wealth
- to promote balanced regional development
- to assist in development of small-scale and ancillary industries
- to promote import substitution; to save and earn foreign exchange

## Activities of state-owned enterprises of India

State-owned enterprises control India's production of petroleum, lignite, copper and lead. The public sector is responsible for 97.6% of the nation's coal production; 77% of steel; 83% of zinc; 36% of aluminum; and about 47% of nitrogenous fertilizers. In addition to minerals production, state-owned enterprises engage in heavy engineering, production of transportation equipment, consumer goods and textiles. State-owned enterprises have been formed to provide services in the areas of trading and marketing; transportation; contracting and construction; industrial development; technical consultancy; establishment of small industries; tourism and finance.

The number of public sector enterprises has grown from five in April 1951 to 225 in April 1986. Investment has grown from 0.29 billion Indian Rupees (GINR) in 1957 to 503.41 GINR in 1986. The investment share in mineral-based industries (steel, minerals and metals, coal and petroleum) is about 42%; of that, minerals and metals account for 7.20% (including 1% for copper production). 47.6 GINR has also been invested in mineral-based projects under construction (steel, aluminium and phosphatic fertilizer).

## Achievements

India's promotion of a mixed economy, planned infrastructure development and the contributions of state-owned enterprises made possible the attainment of most Five Year Plan objectives and acceptable manufacturing growth. The country has become self-reliant in mining and the production of the primary metals, especially of iron and steel, copper, lead, zinc and aluminium (apart from fuels - solid and non-solid). There is evidence that as a result of national economic policy India is on a new growth path. In the 1980's, the average

annual rate of growth has been 5%, which is higher than historical trends. While industrial growth is increasing, inflation is under control and, in the current period (1986-1987) the trade deficit has been reduced significantly.

### Export and import of ores, mineral-based products

Export and import of ores, minerals and mineral-based products reflect the impact of national economic policy for industrialization and international co-operation. During 1984, India's total export was 8.8 billion, which represented .46% of the world's exports by commodity division. In 1971, the country exported ores and minerals valued at 16.4 GINR. This figure rose to 63.8 GINR in 1984-85 (Table 2). The share of these products of total national exports was 10.7% in 1970-71 and 5.4% in 1984-85.

However, imports of raw materials and intermediate goods amounted to 88.9 GINR in 1970-71, and rose to 1289.6 GINR in 1984-85 (Table 3). The share of this category in total imports

was 54.4% in 1970-71; it rose to 77.8% in 1980-81 and 75.3% in 1984-85. Imports of petroleum, fertilizer and chemicals accounted primarily for this increase.

The import share of iron and steel and non-ferrous metals, meanwhile, fell from 16.3% in 1970-71 to 7.9% in 1984-85. The share of capital goods was 24.7% in 1970-71, 15.2% in 1980-81 and 18.5% in 1984-85. This is strong evidence of India's dependence on imports for mineral-based products and capital goods, despite increases in production of iron and steel and non-ferrous metals (such as copper lead and zinc), which account for a decreasing share of total imports. The export/import balance of iron and steel and non-ferrous metals showed a 10.2 GINR difference during 1970-71, however, which rose to 71.5 GINR in 1984-85.

### Impact of world economic changes on Indian metal mining

Changes in the world economy during the 1980's have greatly affected Indian

metal industries. Virtually all metal prices have become depressed, which benefits consumers but hurts producers. Some factors responsible for this trend are as follows:

- deceleration of world economic growth
- stagnation in demand for metals
- increasing importance of scrap and leachable mineral-bearing wastes.
- miniaturization and substitution
- state ownership
- overlapping of business and socio-political objectives

These factors are not mutually exclusive. In addition, the number of factors affecting each policy decision varies. The result for producers, however, is the same - depressed prices and the need to cut costs to stay in business. Although changes in the world metal markets have strained the Indian metal mining industry, the nation's overall economic resilience and continual adjustments to state-

**Table 1**  
Reserves/resources of major solid minerals of India  
(as of March 31, 1983)

Mineral	Quantity(Mt)	Grade	Remarks
Bauxite	1 960.19	Metallurgical	Sufficient, partly exportable
	34.22	Chemical, abrasive refractory	Poor
	663.07	Others	
Coal	120 105.03	All grades	Sufficient
Copper	566.26	1.11%Cu	Inadequate poor grade, small size
Gold	14.81		Poor grade
Lead-Zinc	360.22	1.62%Pb, 4.99%Zn	Inadequate
Chromite	111.25	All grades	Adequate
Iron ore	11 469.71	All grades	Adequate partly exportable
Manganese ore	116.63	All grades	Adequate for limited period
Nickel ore	160.26	1%Ni	Amenability to metallurgical extraction is uncertain

owned industries have minimized their impact and ensured an overall growth rate close to target.

### Intensity of Indian metal use

Indian consumption of major metals -- aluminium, refined copper, lead, zinc, crude steel and nickel -- has fluctuated with economic and political developments such as oil price fluctuations of the 1970s and 80s; recession; development of new manufacturing capabilities; and international border tension (Tab. 4).

### India's copper industry-history

Mining and smelting of Indian copper ores and concentrates have continued without interruption since 1928, when development in the Singhbhum Copper Belt, Bihar was begun by the Indian Copper Corporation, which was owned by a British firm. Primary metal production rose to about 9.8 kt in 1962. Refined copper was partially or wholly converted to brass until the 1966 establishment of a refinery. This integrated unit was nationalized in 1972, after

which mining cut-off grade was reduced. Production was then raised to 15 kt/year.

India's Industrial Policy Resolutions of 1948 and 1956 resulted in the formation, in 1958, of the *National Mineral Development Corporation Limited* (NMDC) to explore and develop resources and to produce minerals and metals (primarily iron ore, copper and diamonds). In 1967, *Hindustan Copper Limited* (HCL) was incorporated as a public sector enterprise under the provisions of the 1956 Companies Act. Hindustan Copper took over all NMDC start-up copper projects, as well as the re-

**Table 2**  
Principal exports of India in selected years  
(in MINR)

Years (April to March)

	1970-71	1975-76	1980-81	1981-82	1982-83	1983-84	1984-85
I. Agricultural & allied products	4 870.1	14 936.3	20 566.6	22 211.3	24 499.9	26 218.5	29 963.3
%share	31.7	37.0	30.6	28.5	27.8	26.8	25.5
II. Ores & minerals	1 640.2	2 963.2	4 135.6	4 587.9	4 907.5	5 062.3	6 376.1
%share	10.7	7.3	6.2	5.9	5.6	5.2	5.4
Of which manganese ores	139.3	175.1	126.9	148.1	144.8	134.2	236.1
Mica	155.6	146.3	176.8	296.1	201.3	191.6	195.7
Iron ores	1 172.8	2 137.9	3 033.3	3 517.5	3 805.0	4 015.6	4 594.4
%share	7.6	5.3	4.5	4.5	4.3	4.1	3.9
III. Manufactured goods	7 719.7	17 509.7	37 468.1	43 696.3	45 510.6	4 9603.7	62 100.9
%share	50.3	43.4	55.8	56.0	51.7	50.8	52.8
Of which iron & steel (Prime)	672.0	681.8	116.8	68.0	608.1	481.0	457.3
%share	4.4	1.7	0.2	0.1	0.7	0.5	0.6
IV. Mineral fuels & lubricant	126.0	355.8	278.5	2 248.9	12 404.2	15 900.4	18 229.4
%share	0.8	0.9	0.4	2.9	14.1	16.3	15.5
V. Others	995.6	4 597.6	4 658.2	5 314.6	701.5	832.2	767.1
%share	6.5	11.4	6.9	6.8	0.8	0.9	0.7
<b>Total</b>	<b>1 5351.6</b>	<b>4 0362.6</b>	<b>67 107.0</b>	<b>78 059.0</b>	<b>88 033.7</b>	<b>97 707.1</b>	<b>117 436.8</b>
	100.0	100.0	100.0	100.0	100.0	100.0	100.0

cently-nationalized Indian Copper Corporation. Since 1972, Hindustan Copper Limited has been India's sole producer of primary refined copper.

### HCL's operations

Hindustan Copper operates three groups of mines: in Singhbhum Copper Belt (Bihar); Khetri Copper Belt (Rajasthan); and Malanjkhand (Madhya Pradesh). All three are located in undeveloped and tribal areas of the country. They employ a total workforce of 26 000. HCL's holdings include ten working mines and six concentrators for production of ores and concentrates that are treated in two company smelting and refining complexes.

In addition, two sulphuric acid plants have been established for pollution control, as well as a fertilizer plant to produce super phosphate utilizing acid produced. HCL is also recovering small quantities of precious metals and ore by-products.

HCL-run mines vary in production capacity, depth, age, ore characteristics, thickness and grade. Therefore, there are variations in methods of extraction, amenability to mechanization and cost of production.

HCL has facilities for producing 47.5 kt/year of primary copper. This present investment, when augmented by marginal investment in replacement, renewal and modernization, will enable

production of between 50 and 60 kt of copper concentrates annually for the next 20 years. However, the potential of some of the prospects in the Singhbhum Copper Belt and Malanjkhand Copper Deposit (presently being worked as an open pit mine), if realized, could result in 100 kt of annual production.

### Indigenous demand and supply of refined copper

India presently consumes about 116 kt of copper each year. Demand is expected to rise to more than 200 kt by the year 2000. Thus, domestic production is expected to be able to satisfy 30% to 50% of India's demand in the near future.

**Table 3**  
Principal imports of India in selected years  
(in MINR)

#### Years (April to March)

	1970-71	1975-76	1980-81	1981-82	1982-83	1983-84	1984-85
I. Food & live animals chiefly for food	2 424	13 954	3 802	6 901	6 381	10 181	6 948
% share	14.8	26.5	3.0	5.1	4.5	6.4	4.1
II. Raw materials & intermeddiate manufacture	8 886	27 936	97 596	101 382	106 427	110 945	128 958
% Share	54.4	53.1	77.8	74.5	74.5	70.1	75.3
Of which petroleum & oil lubricants	1 366	12 561	52 665	51 895	56 219	48 320	54 091
% share	8.4	23.8	42.0	38.1	39.3	30.5	31.6
Iron & steel	1 470	3 119	8 524	12 035	11 722	10 487	9 411
% share	9.0	5.9	6.8	8.8	8.2	6.6	5.5
Non-ferrous metals	1 194	1 004	4 774	3 971	3 446	3 906	4 117
% share	7.3	1.9	3.8	2.9	2.4	2.5	2.4
III. Capital goods	4 040	9 677	19 103	20 961	27 162	33 223	31 678
% share	24.7	18.4	15.2	15.4	19.0	21.0	18.5
IV. Others	992	1 081	4 991	6 831	2 956	3 966	3 758
% Share	6.1	2.1	4.0	5.0	2.1	2.5	2.2
<b>Total</b>	<b>16 342</b>	<b>52 648</b>	<b>125 492</b>	<b>136 076</b>	<b>142 927</b>	<b>158 315</b>	<b>171 342</b>
	100.0	100.0	100.0	100.0	100.0	100.0	100.0

## Growth of mine production

Hindustan Copper Limited has been able to improve its production by increasing its capacity utilization and by employing bulk mining where possible to improve productivity and efficiency. During the next three years, the Company has targeted production and milling at five to six million tons of ore and 50 to 57 kt of metal in contrates. Production will be equivalent to 46 to 56 kt annually of saleable copper.

## Financial results

Distressed copper prices have resulted in HCL's showing poor financial results despite substantial improvements in production and operational efficiency. The following factors also push up production costs:

- low grade of ores and absence of large deposits
- small-scale operations
- high costs of inputs, especially imported equipment and spare parts, on which duty can run up to 120%
- shortage of power, and its high costs
- nominal by-product credit
- poor infrastructure in underdeveloped areas
- social welfare expenditure

The administered price of saleable copper is based on LME prices; it is usually lower than the actual cost of production. This has contributed to HCL's deteriorated financial health, as it has to the fiscal position of industries in many other countries.

HCL, therefore, works aggressively to contain production costs. It controls consumption, recoveries, variable and

fixed expenditures strictly through detailed budget controls. The company has undertaken a number of measures to reduce production costs, including technological upgrading; maximization of production capacity; modernization and production-flow efficiency programs; and reduction in the labor force through voluntary retirement. These programs have reduced the rate of increase in production costs.

## Increase in copper production costs

The depressed market price of copper has been sustained mainly through currency adjustments. If the 1984 cost of production of primary copper in many countries is compared with the 1980 rate in local currency, production costs can be shown to have increased between 12.59% in South Africa, to 82.5% in

**Table 4**  
Per capita consumption of major metals in India  
(g/capita) Refined primary crude

Year	Copper	Aluminium	Lead	Zinc	Nickel	Steel
1960	144	58	57	139	-	10733
1961	154	68	71	169	-	12172
1962	172	108	80	187	-	14235
1963	170	134	87	176	-	15758
1964	139	120	80	141	-	15749
1965	133	147	77	144	-	15583
1966	66	189	89	122	2	13877
1967	89	235	73	119	2	12703
1968	67	148	71	157	2	11372
1969	96	218	57	154	2	11497
1970	93	301	77	180	3	11935
1971	111	350	60	166	5	13985
1972	105	307	73	182	3	16363
1973	109	257	72	135	3	14272
1974	84	211	72	146	5	14320
1975	73	240	60	136	5	14085
1976	68	275	85	146	6	13289
1977	84	297	86	154	9	16133
1978	114	318	85	167	9	15580
1979	103	321	89	176	10	16768
1980	114	346	80	141	10	17773
1981	109	362	82	156	14	20249
1982	118	312	96	186	16	19186
1983	133	303	83	174	18	16868
1984	115	421	84	169	21	17344
1985	151	396	93	173	19	-

Peru. The annual increase in the cost of production has been low in Papua New Guinea (3.06%), Sweden (4.01%) and Canada (6.54%). Only the United States shows a drop in production costs, averaging 4.3% per year. India's production costs rose 5.12% per year in that period.

### Problems of India's copper mining industry-scope of production cost reduction

Cost reductions in India's primary copper industry have been overtaken by escalation in input costs. The possibility of further cuts in production costs is limited. The depressed cost of copper on the world market will remain a major problem, if indigenous copper price is linked to the LME price instead of to producers' costs. Normal inflation of input costs is a second factor that will hurt the industry. Further deterioration of producer's financial performance is inevitable if inflation is not offset by an increase in copper prices on the world market.

The chances of producing ores and concentrates from new deposits in India are remote. A study of estimated costs for the recovery of copper from demonstrated resources in Market Economy Countries has been carried out by the United States Bureau of Mines. It indicates that, using North American norms of investment and operations, the cost of producing copper from Indian ore deposits would be 1.50/lb to 2.00/lb in 1981 dollars. This estimate holds for current conditions. Therefore, as long as the world market price of copper remains below 1.50-2.00 per pound (1981 dollars), primary copper-making operations in India will not be economic.

### Alternatives and recommendations

Two options are available to India:

**Table 5**  
**Hindustan Copper Limited's output growth**

Year	(kt)	(t)
1979-80	1 855	22 647
1980-81	2 036	24 741
1981-82	2 032	22 853
1982-83	2 786	31 442
1983-84	3 553	43 816
1984-85	3 851	46 387
1985-86	4 519	49 490
1986-87	4 506	49 735

**Table 6**  
**Average annual increase in gross cost of production of copper in different countries in terms of local currency during the period of 1980-84**

	Percentage increase/ decrease per year
USA	- 4.33
Papua New Guinea	3.06
Sweden	4.01
Canada	6.54
South Africa (including Namibia)	12.59
Indonesia	14.19
Zambia	17.38
Chile	17.51
Philippines	21.69
Australia	22.57
Mexico	56.24
Zaire	66.55
Peru	82.50
India	5.12

**Source:**

Compiled from *World Copper Industry*, World Bank Staff Commodity Working Papers, No. 15, 1987.

- 1) Close down mine production/primary copper production and raise imports to meet all primary copper requirements.
- 2) Provide protection adequate to the copper industry adequate to ensure continued operation.

A state-owned operation cannot exercise either option. Analysis indicates, however, that the first option would be self-defeating in the long run for the following reasons:

- India's needs for primary copper are small compared with world consumption. Total dependence on imported copper could be detrimental. If mine production is curtailed, the growth of integrated activities in other countries may affect availability of concentrates for India's smelters.
- skills and expertise for integrated mining-smelting-refining operations would be lost
- unemployment will increase, and regional development already attained cannot be sustained
- the national trade deficit will increase, and further strain the Indian economy
- Support for continuing copper mining operations is preferable for the following reasons:
- India will remain self-reliant
- Primary copper production capacity can be sustained and expanded. Uneconomic deposits may turn out to be viable; further expansion in underdeveloped areas would be possible.
- Import substitution would save scarce foreign exchange.
- Miniaturization and substitution threats would, paradoxically, help the country reduce imports and attain greater self-sufficiency.

## Financial imbalance between basic industries and manufacturing industries

India's copper-based manufacturing industry is yielding significant profits, even while its primary copper producing sector is under heavy financial strain. Considerable value-addition accrues to finished products; for example, winding-wire prices are four to five times the price of refined copper (all rates excluding duties). Price supports available to the primary copper industry would transfer to the consumer-product manufacturing industry and copper-importing agency, neither of which have a stake in growth or viability of HCL.

## Remedial financial measures

The following remedial measures are being considered to improve the financial position of India's primary copper-producing industries:

- adequate price support
- forward integration to produce value-added products
- capital restructuring by loan conversion to equity capital
- interest and loan repayment deferrals
- concessional duties on toll smelting
- basing administered copper prices on a combination of the import price of copper and the costs of producing it indigenously
- channeling national sales through HCL
- phasing out of relatively uneconomic deep mines and developing new shallow deposits
- expanding the production capacity of the open-pit mine at Malanjkhand, if feasible

- leaching and recovering copper from leachable oxidized, submarginal or lean ores

The government has taken action on the last three recommendations, with policy-level consideration being given to the others.

## Conclusion

Imbalances in depletion of non-renewable resources exist within different regions and economies that result in differential earnings volumes, particularly among developing countries. However, primary metal-based manufacturing industries in industrially developed countries do not experience similarly depressed returns.

## Notes and references

<sup>1</sup> The author is grateful to the Government of India and the United Nations for nominating him to present this paper at the United Nations Interregional Seminar on the Role of State Enterprises in the Solid Minerals Industry in Developing Countries.

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<sup>3</sup> Ministry of Finance, *Economic Survey, 1986-87*, Government of India, 1987.

<sup>4</sup> R.G. Carnegie, *Outlook for Mineral Commodities*, Group of Thirty, New York, March 1986, Marian Radetzki, "Structural Change and Depression in World Metal Industries", paper presented at the 4th Mineral Economics Symposium, Vancouver, Canada, November 1986.

<sup>5</sup> Ministry of Finance, op. cit.

<sup>6</sup> Kenji Takeuchi, J.E. Strongman, Shunichi Maeda and C. Suan Tan, *The World Copper Industry - Its Changing Structure and Future Prospects*, World Bank Staff Commodity Working Papers No. 15, New York, World Bank, 1987.

<sup>7</sup> A.F. Barsotti, and Rosen Kranz, "Estimated Costs for the Recovery of Copper from Demonstrated Resources in Market Economy Countries", *Natural Resources Forum*, No. 2, 1983.